In seven of the first seventeen cases the percentage of reducing substance calculated by the above formula, exceeded that given by the copper test, and by a mean amount of 0.539.

In ten of them it fell short, and by a mean amount of 0.938. This method, therefore, can be relied upon to give results which do not vary from the copper test except by a small amount.

Not much more in the way of accuracy can be claimed for the copper test itself.

In Nos. 18, 19 and 20 we have again the cases where the high specific gravities vitiate the results of the calculation.

CORRECTION FOR SPECIFIC GRAVITY.

I next proceeded to find out a method for correcting the reading of the polariscope for variations, caused by changes in the specific gravity of the specimens. First I determined the percentage of water in glucose of different specific gravities; following are the results:

I.

Sp. gr.	=	1.440
Weight taken	=	5.515. in Pt. dish.
Loss	=	0.35, at 170°, 2 hours.
Per cent H_2O	=	0.35 ÷ 5.515 = 6,37.

II.

Sp. gr.	=	1.431
Weight taken	=	5.86
Loss	=	0.53, 170°, 2 hours.
Per cent H_2O	=	0.53 ÷ 5.89 = 9.05.

III.

Sp. gr.	=	1.409
Weight taken	=	4.038
Loss	=	0.622, 170°, 3 hours.
Per cent H_2O	=	15.40

IV.

Sp. gr.	=	1.416
Weight taken	=	4.425
Loss	=	0.525, 170°, 2 hours.
Per cent H_2O	=	11.93

V.

Sp. gr.	=	1.417
Weight taken	=	8.639
Loss	=	1.091, 170°, 3 hours.
Per cent H_2O	=	12.70

VI.

SOLID GRAPE SUGAR.

Sp. gr.	=	1.463
Weight taken	=	7.215, 170°, 3 hours.
Loss	=	0.61
Per cent H_2O	=	9.29

These data are scarcely sufficient to establish a rule for correction for variations in specific gravity, but it appears from them that the formulæ will not vary much from the following:

The rule, 53 divisions = 53 per cent, seems applicable to samples in which the percentage of H_2O is 12 to 14, and of which the sp. gr. is from 1.409 to 1.414. For each variation of 0.001 in the specific gravity, the percentage of H_2O varies about 0.3.

Thus if we take the two extreme cases, viz.: 6.37 and 15.14 per cent of H_2O, we find the corresponding specific gravities to be 1.440 and 1.409, a difference of 0.031.

The difference in the percentage of water is 9.03. The quotient of 0.0903 ÷ 0.031 = 3 nearly.

Let us apply these data to the correction of Nos. 18, 19 and 20 in table IV. I give below these numbers and also their corrections.

TABLE V.

NUMBER.	Scale.	% Reducing Substance by Calculation.	Same Corrected.	Same by Cu. Sol.
18.....	52.63	53.46	55.83	56.81
19.....	56.53	48.59	55.17	54.60
20.....	53.70	52.10	56.55	51.14

The above corrections were based on the supposition that 53 divisions of the scale correspond to 53 per cent reducing matter, when the sp. gr. = 1.409, and the percentage of water 15.

We may therefore construct the following provisional formulæ for estimating the correction to be applied to the reading of the scale when the sp. gr. of the specimen varies much from 1.409.

Let a = reading of scale.
" a' = corrected reading.
" ε = sp. gr. of the sample.

Then $a' = a - 3\,a\,(\varepsilon - 1.409)$, when the sp. gr. is greater than 1.409, and $a' = a + 3\,a\,(1.409 - \varepsilon)$, when ε is less than 1.409.

I next propose to undertake some investigations to show the nature and number of the optically active principles present in glucose.

THE UNITY OF NATURE.

BY THE DUKE OF ARGYLL.

X.

THE ORIGIN OF RELIGION CONSIDERED IN THE LIGHT OF THE UNITY OF NATURE.

(*Concluded.*)

IN the beginning of this chapter I have observed how little we think of the assumptions which are involved in putting such questions as that respecting the origin of Religion. And here we have come to a point in our investigations at which it is very needful to remember again what some of these assumptions are. In order to do so let us look back for a moment and see where we stand.

We have found the clearest evidence that there is a special tendency in religious conceptions to run into developments of corruption and decay. We have seen the best reasons to believe that the religion of savages, like their other peculiarities, is the result of this kind of evolution. We have found in the most ancient records of the Aryan language proof that the indications of religious thought are higher, simpler, and purer as we go back in time, until at last, in the very oldest compositions of human speech which have come down to us, we find the Divine Being spoken of in the sublime language which forms the opening of the Lord's Prayer. The date in absolute chronology of the oldest Vedic literature does not seem to be known. Professor Max Müller, however, considers that it may possibly take us back 5000 years.[1] This is probably an extreme estimate, and Professor Monier Williams seems to refer the most ancient Vedic hymns to a period not much more remote than 1500 B. C.[2] But whatever that date may be, or the corresponding date of any other very ancient literature, such as the Chinese, or that of the oldest Egyptian papyri, when we go beyond these dates we enter upon a period when we are absolutely without any historical evidence whatever, not only as to the history of Religion, but as to the

[1] Hibbert Lectures, p. 216.
[2] "Hinduism," p. 19.

history and condition of Mankind. We do not know even approximately the time during which he has existed. We do not know the place or the surroundings of his birth. We do not know the steps by which his knowledge "grew from more to more." All we can see with certainty is that the earliest inventions of Mankind are the most wonderful that the race has ever made. The first beginnings of human speech must have had their origin in powers of the highest order. The first use of fire and the discovery of the methods by which it can be kindled; the domestication of wild animals; and above all the processes by which the various cereals were first developed out of some wild grasses—these are all discoveries with which in ingenuity and in importance no subsequent discoveries may compare. They are all unknown to history—all lost in the light of an effulgent dawn. In speculating, therefore, on the origin of these things, we must make one or other of two assumptions—either that Man always had the same mental faculties and the same fundamental intellectual constitution that he has now, or that there was a time when these faculties had not yet risen to the level of Humanity, and when his mental constitution was essentially inferior.

On the first of these assumptions we proceed on the safe ground of inquiry from the known to the unknown. We handle a familiar thing; we dissect a known structure; we think of a known agency. We speculate only on the matter of its first behavior. Even in this process we must take a good deal for granted—we must imagine a good deal that is not easily conceivable. I we try to present to our own minds any distinct image of the first Man, whether we supposed him to havef been specially created or gradually developed, we shall soon find that we are talking about a Being and about a condition of things of which science tells us nothing, and of which the imagination even cannot form any definite conception. The temptation to think of that Being as a mere savage is very great, and this theory underlies nine-tenths of all speculations on the subject. But, to say the very least, this may not be true, and valid reasons have been adduced to show that it is in the highest degree improbable. That the first Man should have been born with all the developments of savagery is as impossible as that he should have been born with all the developments of civilization. The next most natural resource we have is to think of the first Man as something like a child. But no man has ever seen a child which never had a parent, or some one to represent a parent. We can form no picture in our mind's eye of the mental condition of the first Man, if we suppose him to have had no communication with, and no instruction from, some Intelligence other than his own. A child that has never known anything, and has never seen example, is a creature of which we have no knowledge, and of which therefore we can form no definite conception. Our power of conceiving things is, of course, no measure of their possibility. But it may be well to observe where the impossibilities of conception are, or may be, of our own making. It is at least possible that the first Man may not have been born or created in the condition which we find to be so inconceivable. He may have been a child, but having, what all other children have, some intimations of Authority and some acquaintance with its Source. At all events, let it be clearly seen that the denial of this possibility is an assumption; and an assumption too which establishes an absolute and radical distinction between childhood as we know it, and the inconceivable conditions of a childhood which was either without Parents, or with Parents who were comparatively beasts. Professor Max Müller has fancied our earliest forefathers as creatures who at first had to be "roused and awakened from mere staring and stolid wonderment," by certain objects "which set them for the first time musing, pondering, and thinking on the visions floating before their eyes." This is a picture evidently framed on the assumption of a Fatherless childhood—of a Being born into the world with all the innate powers of Man, but absolutely deprived of all direct communication with any Mind or Will analogous to his own. No such assumption is admissible as representing any reasonable probability. But at least such imaginings as these about our first parents have reference to their external conditions only, and do not raise the additional difficulties involved in the supposition that the first Man was half a beast.

Very different is the case upon the other of the two assumptions which have been indicated above. On the assumption that there was a time when Man was different in his own proper nature from that nature as we know it now—when he was merely an animal not yet developed into a Man—on this assumption another element of the unknown is introduced, which is an element of absolute confusion. It is impossible to found any reasoning upon data which are not only unknown, but are in themselves unintelligible and inconceivable. Now it seems as if many of those who speculate on the origin of Religion have not clearly made up their minds whether they are proceeding on the first of these assumptions or on the second; that is to say, on the assumption that Man has always been, in respect to faculty, what he now is, or on the assumption that he was once a beast. Perhaps, indeed, it would be strictly true to say that many of those who speculate on the origin of Religion proceed upon the last of these assumptions without avowing it, or even without distinctly recognizing it themselves. It may be well, therefore, to point out here that on this assumption the question cannot be discussed at all. We must begin with Man as Man, when his development or his creation had made him what he is; not indeed as regards the acquisitions of experience or the treasures of knowledge, but what he is in faculty and in power, in the structure and habit of his mind, in the instincts of his intellectual and moral nature.

But, as we have also seen at the beginning of this chapter, there are two other assumptions between which we must choose. Besides assuming something as to the condition and the powers of the first Man, we must also make one or other of two assumptions as to the existence or non-existence of a Being to whom his mind stands in close relation. One is the assumption that there is no God; and then the problem is, how Man came to invent one. The other is that there is a God; and then the question is, whether He first formed, and how long He left, His creature without any intuition or revelation of Himself?

It is really curious to observe in many speculations on the origin of Religion how unconscious the writers are that they are making any assumption at all on this subject. And yet in many cases the assumption distinctly is that, as an objective reality, God does not exist, and that the conception of such a Being is built up gradually out of wonderings and guessings about "the Infinite" and "the Invisible."

On this assumption I confess that it does not appear to me to be possible to give any satisfactory explanation of the origin of Religion. As a matter of fact, we see that the tendency to believe in divine or superhuman Beings is a universal tendency in the human mind. As a matter of fact, also, we see that the conceptions which gather round this belief—the ideas which grow up and are developed from one consequence to another respecting the character of these superhuman Personalities and the relations to mankind—are beyond all comparison the most powerful agencies in molding human nature for evil or for good. There is no question whatever about the fact that the most terrible and destructive customs of barbarian and of savage life are customs more or less directly connected with the growth of religious superstitions. It was the perception of this fact which inspired the intense hatred of Religion, as it was known to

him, which breathes in the memorable poem of Lucretius. In all literature there is no single line more true than the famous line—"Tantum religio potuit suadere malorum." Nor is it less certain, on the other hand, that the highest type of human virtue is that which has been exhibited in some of those whose whole inspiration and rule of life has been founded on religious faith. Religious conceptions have been historically the centre of all authority, and have given their strength to all ideas of moral obligation. Accordingly, we see that the same hatred which inspired Lucretius against Religion because of its power for evil, now inspires other men against it because of its power for good. Those who wish to sever all the bonds which bind human society together, the State, the Church, the Family, and whose spirits are in fierce rebellion against all Law, human or divine, are and must be bitter enemies of Religion. The idea must be unendurable to them of a Ruler who cannot be defied, of a Throne which cannot be overturned, of a Kingdom which endureth throughout all generations. The belief in any Divine Personality as the source of the inexorable laws of Nature is a belief which enforces, as nothing else can enforce, the idea of obligation and the duty of obedience.

It is not possible, in the light of the unity of Nature, to reconcile this close and obvious relation between religious conceptions and the highest conditions of human life with the supposition that these conceptions are nothing but a dream. The power exercised over the mind and conduct of Mankind, by the belief in some Divine Personality with whom they have to do, is a power of having all the marks that indicate an integral part of the system under which we live. But if we are to assume that this belief does not represent a fact, and that its origin is any other than a simple and natural perception of that fact, then this negation must be the groundwork of all speculations on the subject, and must be involved, more or less directly, in every argument we use. But even on this assumption it is not a reasonable explanation of the fundamental postulates of all Religion—namely, the existence of superhuman Beings—to suppose that the idea of personality has been evolved out of that which is impersonal; the idea of Will out of that which has no Intelligence; the idea of life out of that which does not contain it.

On the other hand, if we make the only alternative assumption—namely, that there is a God, that is to say, a Supreme Being, who is the Author of creation,—then the origin of man's perception of this fact ceases to have any mystery other than that which attaches to the origin of every one of the elementary perceptions of his mind and spirit. Not a few of these perceptions tell him of realities which are as invisible as the Godhead. Of his own passions his perception is immediate—of his own love, of his own anger, of his own possession of just authority. The sense of owing obedience may well be as immediate as the sense or a right to claim it. Moreover, seeing the transcendent power of this perception upon his conduct, and, through his conduct, upon his fate, it becomes antecedently probable, in accordance with the analogies of Nature and of all other created Beings, that from the very first, and as part of the outfit of his nature, some knowledge was imparted to him of the existence of his Creator, and of the duty which he owed to Him.

Of the methods by which this knowledge was imparted to him, we are as ignorant as of the methods by which other innate perceptions were implanted in him. But no special difficulty is involved in the origin of a perception which stands in such close relation to the unity of Nature. It has been demanded, indeed, as a postulate in this discussion, that we should discard all notions of antecedent probability—that we should take nothing for granted, except that Man started on his course furnished with what are called his senses, and with nothing more. And this demand may be acceded to, provided it be well understood what our senses are. If by this word we are to understand nothing more than the gates and avenues of approach through which we derive an impression of external objects—our sight, and touch, and smell, and taste, and hearing—then, indeed, it is the most violent of all assumptions that they are the only faculties by which knowledge is acquired. There is no need to put any disparagement on these senses, or to undervalue the work they do. Quite the contrary. It has been shown in a former chapter how securely we may rest on the wonder and on the truthfulness of these faculties as a pledge and guarantee of the truthfulness of other faculties which are conversant with higher things. When we think of the mechanism of the eye, and of the inconceivable minuteness of the ethereal movements which that organ enables us to separate and to discriminate at a glance, we get hold of an idea having an intense interest and a supreme importance. If adjustments so fine and so true as these have been elaborated out of the unities of Nature, whether suddenly by what we imagine as Creation, or slowly by what we call Development, then may we have the firmest confidence that the same law of natural adjustment has prevailed in all the other faculties of the perceiving and conceiving mind. The whole structure of of that mind is, as it were, revealed to be a structure which is in the nature of a growth—a structure whose very property and function it is to take in and assimilate the truths of Nature—and that in an ascending order, according to the rank of those truths in the system and constitution of the Universe. In this connection of thought too great stress cannot be laid on the wonderful language of the senses. In the light of it the whole mind and spirit of Man becomes one great mysterious retina for reflecting the images of Eternal Truth. Our moral and intellectual preceptions of things which, in their very nature, are invisible, come home to us as invested with a new authority. It is the authority of an adjusted structure—the mental organization of which has been molded by what we call natural causes—these being the causes on which the unity of the world depends.

And when we come to consider how this molding, and the molding of the human body, deviates from that of the lower animals, we discover in the nature of this deviation a law which cannot be mistaken. That law points to the higher power and to the higher value in his economy of faculties which lie behind the senses. The human frame diverges from the frame of the brutes, so far as the mere bodily senses are concerned, in the direction of greater helplessness and weakness. Man's sight is less piercing than the eagle's. His hearing is less acute than the owl's or the bat's. His sense of smell may be said hardly to exist at all when it is compared with the exquisite susceptibilities of the deer, of the weasel, or of the fox. The whole principle and plan of structure in the beasts which are supposed to be nearest to him in form, is a principle and a plan which is almost the converse of that on which his structure has been organized. The so-called man-like Apes are highly specialized; Man on the contrary is as highly generalized. They are framed to live almost entirely on trees, and to be dependent on arboreal products, which only a very limited area in the globe can supply. Man is framed to be independent of all local conditions, except indeed those extreme conditions which are incompatible with the maintenance of organic life in any form. If it be true, therefore, that he is descended from some "arboreal animal with pointed ears," he has been modified during the steps of that descent on the principle of depending less on senses such as the lower animals possess, and more and more on what may be called the senses of his mind. The unclothed and unprotected condition of the human body, the total abscence of any organic weapon of defense, the want of teeth adapted even for prehension, and the same want of power for similar purposes in the hands and fingers—these are all changes and departures from the mere animal type which stand in obvious relation to the mental

powers of Man. Apart from these, they are changes which would have placed the new creature at a hopeless disadvantage in the struggle for existence. It is not easy to imagine—indeed, we may safely say that it is impossible to conceive--the condition of things during any intermediate steps in such a process. It seems as if there could be no safety until it had been completed—until the enfeebled physical organization had been supported and reinforced by the new capacities for knowledge and design. This, however, is not the point on which we are dwelling now. We are now speculating on the origin of Man. We are considering him only as he is, and as he must have been since he was Man at all. And in that structure as it is, we see that the bodily senses have a smaller relative importance than in the beasts. To the beasts theses sense tell them all they know. To us they speak but little compared with all that our spirit of interpretation gathers from them. But that spirit of interpretation is in the nature of a sense. In the lower animals every external stimulus moves to some appropriate action. In Man it moves to some appropriate thought. This is an enormous difference; but the principle is the same. We can see that, so far as the mechanism is visible, the plan or the principle of that mechanism is alike. The more clearly we understand that this organic mechanism has been a growth and a development, the more certain we may be that in its structure it is self-adapted, and that in its working it is true. And the same principle applies to those other faculties of our mental constitution which have no outward organ to indicate the machinery through which their operations are conducted. In them the spirit of interpretation is in communication with the realities which lie behind phenomena—with energies which are kindred with its own. And so we come to understand that the processes of Development or of Creation, whatever they may have been, which culminated in the production of a Being such as Man, are processes wholly governed and directed by a law of adjustment between the higher truths which it concerns him most to know, and the evolution of faculties by which alone he could be enabled to apprehend them. There is no difficulty in conceiving these processes carried to the most perfect consummation, as we do see them actually carried to very high degrees of excellence in the case of a few men of extraordinary genius, or of extraordinary virtue. In science the most profound conclusions have been sometimes reached without any process of conscious reasoning. It is clearly the law of our nature, however, that the triumphs of intellect are to be gained only by laborious thought, and by the gains of one generation being made the starting-point for the acquisition of the next. This is the general law. But it is a law which itself assumes certain primary intuitions of the mind as the starting-point of all. If these were wrong, nothing could be right. The whole processes of reasoning would be vitiated from the first. The first man must have had these as perfectly as we now have them, else the earliest steps of reason could never have been taken, the earliest rewards of discovery could never have been secured. But there is this great difference between the moral and the intellectual nature of Man, that whereas in the work of reasoning the perceptions which are primary and intuitive require to be worked out and elaborately applied, in morals the perceptions which are primary are all in all. It is true that here also the applications may be infinite, and the doctrines of Utility have their legitimate application in enforcing, by the sense of obligation, whatever course of conduct Reason may determine to be the most fitting and the best. The sense of obligation in itself is, like the sense of logical sequence, elementary, and, like it, is part and parcel of our mental constitution. But unlike the mere sense of logical sequence, the sense of moral obligation has one necessary and primary application which from the earliest moment of Man's existence may well have been all-sufficient. Obedience to the will of legitimate Authority is, as we have seen in a former chapter, the first duty and the first idea of duty in the mind of every child. If ever there was a man who had no earthly father, or if ever there was a man whose father was, as compared with himself, a beast, it would seem a natural and almost a necessary supposition that, along with his own new and wonderful power of self-consciousness, there should have been associated a consciousness also of the presence and the power of that Creative Energy to which his own development was due. It is not possible for us to conceive what form the consciousness would take. "No man hath seen God at any time." This absolute declaration of one of the Apostles of the Christian Church proves that they accepted, as metaphorical, the literal terms in which the first communications between Man and his Creator are narrated in the Jewish Scriptures. It is not necessary to suppose that the Almighty was seen by His first human creature walking in bodily form in a garden "in the cool of the day." The strong impressions of a spiritual Presence and of spiritual communications which have been the turning-point in the lives of men living in the bustle of a busy and corrupted world, may well have been even more vivid and more immediate when the first "Being worthy to be called a man" stood in this world alone. The light which shone on Paul of Tarsus on the way to Damascus may have been such a light as shone on the father of our race; or the communication may have been what metaphysicians call purely subjective, such as in all ages of the world do sometimes "flash upon that inward eye which is the bliss of solitude." But none the less may they have been direct and overpowering. The earliest and simplest conception of the Divine Nature might well also be the best. And although we are forbidden to suppose the embodiment and visibility of the Godhead, we are not driven to the alternative of concluding that there never could have been anything which is to us unusual in the intimations of His presence. Yet this is another of the unobserved assumptions which are perpetually made—the assumption of an uniformity in Nature which does not exist. That "all things have continued as they are since the beginning" is conceivable. But that all things should have continued as they were since before the beginning is a contradiction in terms. In primeval times many things had then just been done of which we have no knowledge now. When the form of Man had been fashioned and completed for the first time, like and yet unlike to the bodies of the beasts; when all their organs had been lifted to a higher significance in his; when his hands had been liberated from walking and from climbing, and had been elaborated into an instrument of the most subtle and various use; when his feet had been adapted for holding him in the erect position; when his breathing apparatus had been set to musical chords of widest compass and the most exquisite tones; when all his senses had become ministers to a mind endowed with wonder and with reverence, and with reason and with love—then a work had been accomplished such as the world had not known before, and such as has never been repeated since. All the conditions under which that work was carried forward must have been happy conditions—conditions, that is to say, in perfect harmony with its progress and its end. They must have been favorable, first, to the production and then to the use of those higher faculties which separated the new creature from the beasts. They must have been in a corresponding degree adverse to the incompatible with the prevalence of conditions tending to reversion or to degradation in any form. That long and gradual ascent, if we assume it to have been so,—or, as it may have been, that sudden transfiguration,—must have taken place in a congenial air and amid surroundings which lent themselves to so great a change. On every conceivable theory, therefore, of the origin of Man, all this seems a necessity of thought.

But perhaps it seems on the Theory of Development even more a necessity than on any other. It is of the essence of that theory that all things should have worked together for the good of the Being that was to be. On the lowest interpretation, this "toil co-operant to an end" is always the necessary result of forces ever weaving and ever interwoven. On the higher interpretation it is the same. Only, some Worker is ever behind the work. But under either interpretation the conclusion is the same. That the first man should have been a savage, with instincts and dispositions perverted as they are never perverted among the beasts, is a supposition impossible and inconceivable. Like every other creature, he must have been in harmony with his origin and his end—with the path which had led him to where he stood, with the work which made him what he was. It may well have been part of that work—nay, it seems almost a necessary part of it—to give to this new and wonderful Being some knowledge of his whence and whither—some open vision, some sense and faculty divine.

With arguments so deeply founded on the analogies of Nature in favor of the conclusion that the first Man, though a child in acquired knowledge, must from the first have had instincts and intuitions in harmony with his origin and with his destiny, we must demand the clearest proof from those who assume that he could have had no conception of a Divine Being, and that this was an idea which could only be acquired in time from staring at things too big for him to measure, and from wondering at things too distant for him to reach. Not even his powers could extract from such things that which they do not contain. But in his own Personality, fresh from the hand of Nature,—in his own spirit just issuing from the fountains of its birth,—in his own Will, willing according to the law of its creation,—in his own desire of knowledge,—in his own sense of obligation,—in his own wonder and reverence and awe,—he had all the elements to enable him at once to apprehend, though not to comprehend, the Infinite Being who was the Author of his own.

It is, then, with that intense interest which must ever belong to new evidence in support of fundamental truths that we find these conclusions, founded as they are on the analogies of Nature, confirmed and not disparaged by such facts as can be gathered from other sources of information. Scholars who have begun their search into the origin of Religion in the full acceptance of what may be called the savage theory of the origin of Man—who, captivated by a plausible generalization, had taken it for granted that the farther we go back in time, the more certainly do we find all Religion assuming one or other of the gross and idolatrous forms which have been indiscriminately grouped under the designation of Fetishism—have been driven from this belief by discovering to their surprise that facts do not support the theory. They have found, on the contrary, that up to the farthest limits which are reached by records which are properly historical, and far beyond those limits to the remotest distance which is attained by evidence founded on the analysis of human speeeh, the religious conceptions of men are seen as we go back in time to have been not coarser and coarser, but simpler, purer, higher—so that the very oldest conceptions of the Divine Being of which we have any certain evidence are the simplest and best of all.

In particular, and as a fact of typical significance, we find very clear indications that everywhere Idolatry and Fetishism appear to have been .corruptions, whilst the higher and more spiritual conceptions of Religion which lie behind do generally even now survive among idolatrous tribes as vague surmises or as matters of speculative belief. Nowhere even now, it is confessed, is mere Fetishism the whole of the Religion of any people. Everywhere, in so far as the history of it is known, it has been the work of evolution, the development of tendencies which are deviations from older paths. And not less significant is the fact that everywhere in the imagination and traditions of Mankind there is preserved the memory and the belief in a past better than the present. "It is a constant saying," we are told, "among African tribes that formerly heaven was nearer to man than it is now; that the highest God, the Creator Himself, gave formerly lessons of wisdom to human beings; but that afterwards He withdrew from them, and dwells now far from them in heaven." All the Indian races have the same tradition; and it is not easy to conceive how a belief so universal could have risen unless as a survival. It has all the marks of being a memory and not an imagination. It would reconcile the origin of Man with that law which has been elsewhere universal in creation—the law under which every ceature has been produced not only with appropriate powers, but with appropriate instincts and intuitive perceptions for the guidance of these powers in their exercise and use. Many will remember the splendid lines in which Dante has defined this law, and has declared the impossibility of Man having been exempt therefrom:—

> Nell' ordine ch'io dico sono accline
> Tutte nature per diverse sorti
> Più al principio loro, e men vicine;
> Onde si muovono a diversi porti
> Per lo gran mar dell' essere; e ciascuna
> Con istinto a lei dato che la porti.
>
> * * * * *
>
> Nè pur le creature, che son fuore
> D'intelligenzia, quest'arco saetta,
> Ma quelle c'hanno intelletto ed amore.[3]

The only mystery which would remain is the mystery which arises out of the fact that somehow those instincts have in Man not only been liable to fail, but that they seem to have acquired apparently an ineradicable tendency to become perverted. But this is a lesser mystery than the mystery which would attach to the original birth or creation of any breature in the condition of a human savage. It is a lesser mystery because it is of the essence of a Being whose Will is comparatively free that he should be able to deviate from his appointed path. The origin of evil may appear to us to be a great mystery. But this at least may be said in mitigation of the difficulty, that without the possibility of evil there could be no possibility of any virtue. Among the lower animals obedience has always been a necessity. In Man it was raised to the dignity of a duty. It is in this great change that we can see and understand how it is that the very elevation of his nature is inseparable from the possibility of a Fall. The mystery, then, which attaches to his condition now is shifted from his endowments and his gifts to the use he made of them. The question of the origin of Religion is merged and lost in the question of the origin of Man. And that other question, how his Religion came to be corrupted, becomes intelligible on the supposition of wilful disobedience with all its consequences having become "inherited and organized in the race." This is the formula of expression which has been invented or accepted by those who do not believe in original instincts or intuitions, even when these are in harmony with the order and with the reasonableness of Nature. It may well therefore be accepted in a case where we have to account for tendencies and propensities which have no such character—which are exceptions to the unity of Nature, and at variance with all that is intelligible in its order, or reasonable in its law.

If all explanation essentially consists in the reduction of phenomena into the terms of human thought and into the analogies of human experience, this is the explanation which can alone reconcile the unquestionable corruption of human character with the analogies of Creation.

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[3] "Paradiso," canto i. 110-120.

For the present I must bring these papers to a close. If the conclusions to which they point are true, then we have in them some foundation-stones strong enough to bear the weight of an immense, and, indeed, of an immeasurable, superstructure. If the Unity of Nature is not a unity which consists in mere sameness of material, or in mere identity of composition, or in mere uniformity of structure, but a unity which the mind recognizes as the result of operations similar to its own; if man, not in his body only, but in the highest as well as in the lowest attributes of his spirit, is inside this Unity and part of it; if all his powers are, like the instincts of the beasts, founded on a perfect harmony between his faculties and the realities of creation; if the limits of his knowledge do not affect its certainty; if its accepted truthfulness in the lower fields of thought arises out of correspondences and adjustments which are applicable to all the operations of his intellect, and all the energies of his spirit; if the moral character of Man, as it exists now, is the one great anomaly in Nature—the one great exception to its order and to the perfect harmony of its laws; if the corruption of this moral character stands in immediate and necessary connection with rebellion against the Authority on which that order rests; if all ignorance and error and misconception respecting the nature of that Authority and of its commands has been and must be the cause of increasing deviation, disturbance, and perversion, then, indeed, we have a view of things which is full of light. Dark as the difficulties which remain may be, they are not of a kind to undermine all certitude, to discomfit all conviction, and to dissolve all hope. On the contrary, some of these difficulties are seen to be purely artificial and imaginary, whilst many others are exposed to the suspicion of belonging to the same class and category. In some cases our misgivings are shown to be unreasonable, whilst in many other cases, to say the least, doubt is thrown on Doubt. Let destructive criticism do its work. But let that work be itself subjected to the same rigid analysis which it professes to employ. Under the analysis, unless I am much mistaken, the destroyer will be destroyed. That which pretends to be the universal solvant of all knowledge and of all belief, will be found to be destitute of any power to convict of falsehood the universal instinct of Man, that by a careful and conscientious use of the appropriate means he can, and does, attain to a substantial knowledge of the Truth.

ELEMENTS OF COMET (*b*), 1881.

(Communicated by Rear Admiral JOHN RODGERS, Superintendent U. S. Naval Observatory.)

The following elements have been computed by Prof. Frisby, U. S. N., from observations made with the Transit Circle at the Naval Observatory:

Time of perihelion passage, June 16, .37001.

π	=	265°	31′	15.″4
Ω	=	270	58	27
log q	=	9.866748		
ι	=	63	25	55.7

MIDDLE PLACE.

C — O

$\delta\lambda \cos\beta$ — 13.″4

$\delta\beta$ + 62.1

METEOROLOGICAL REPORT FOR NEW YORK CITY FOR THE WEEK ENDING AUG. 13, 1881.

Latitude 40° 45′ 58″ N.; Longitude 73° 57′ 58″ W.; height of instruments above the ground, 53 feet; above the sea, 97 feet; by self-recording instruments.

AUGUST.	BAROMETER. MEAN FOR THE DAY. Reduced to Freezing.	BAROMETER. MAXIMUM. Reduced to Freezing.	BAROMETER. MAXIMUM. Time.	BAROMETER. MINIMUM. Reduced to Freezing.	BAROMETER. MINIMUM. Time.	THERMOMETERS. MEAN. Dry Bulb.	MEAN. Wet Bulb.	MAXIMUM. Dry Bulb.	MAXIMUM. Time.	MAXIMUM. Wet Bulb.	MAXIMUM. Time.	MINIMUM. Dry Bulb.	MINIMUM. Time.	MINIMUM. Wet Bulb.	MINIMUM. Time.	MAXI'M In Sun.
Sunday, 7--	29.773	29.810	0 a. m.	29.722	2 p. m.	73.6	70.6	79	2 p. m.	73	2 p. m.	67	12 p. m.	67	12 p. m.	123.
Monday, 8--	29.889	29.910	12 p. m.	29.796	0 a. m.	70.0	65.3	78	5 p. m.	69	7 p. m.	61	5 a. m.	60	5 a. m.	140.
Tuesday, 9--	29.794	29.910	0 a. m.	29.632	12 p. m.	74.0	67.7	81	3 p. m.	71	6 p. m.	62	5 a. m.	61	6 a. m.	141.
Wednesday, 10--	29.616	29.710	12 p. m.	29 578	5 a. m.	77.3	70.0	86	2 p. m.	74	5 p. m.	64	12 p. m.	62	12 p. m.	141.
Thursday, 11--	29.832	29.878	10 a. m.	29.710	0 a. m.	69.7	63.3	78	4 p. m.	67	6 p. m.	59	5 a. m.	58	5 a. m.	139.
Friday, 12--	29.803	29.872	7 a. m.	29.700	12 p. m.	74.6	67.6	81	2 p. m.	71	2 p. m.	62	5 a. m.	61	5 a. m.	138.
Saturday, 13--	29.560	29.700	0 a. m.	29.498	6 p. m.	81.3	73.7	96	4 p. m.	81	6 p. m.	70	5 a. m.	66	5 a. m.	146.

		Dry.	Wet.
Mean for the week	29.752 inches.	74.3 degrees	68.3 degrees.
Maximum for the week	29.910 "	at 4 pm. 13th 96. "	at 6 pm 13th, 81. "
Minimum "	at 7 p. m., August 6th 29.498 "	" " 5 am. 11th 59. "	at 5 am 11th, 58. "
Range	.412 "	---- -----37. "	---------- 23. "

AUGUST.	WIND. DIRECTION. 7 a. m.	2 p. m.	9 p. m.	VELOCITY IN MILES. Distance for the Day.	FORCE IN LBS. PER SQR. FEET. Max.	Time.	HYGROMETER. FORCE OF VAPOR. 7 a. m.	2 p. m.	9 p. m.	RELATIVE HUMIDITY. 7 a. m.	2 p. m.	9 p. m.	CLOUDS. CLEAR, 0 OVERCAST, 10 7 a. m	2 p. m.	9 p. m.	RAIN AND SNOW. DEPTH OF RAIN AND SNOW IN INCHES. Time of Beginning.	Time of Ending.	Duration. h. m.	Amount of water	OZONE.
Sunday, 7-	s. w.	s. w.	s. w.	187	6¾	4.30 am	.693	.730	.708	85	74	100	8 cu.	8 cir. cu.	5 cir. cu.	3.45am 2.15pm	9 a m. 10 p m	5.15 7.45	.11 .63	10 0
Monday, 8-	n.	n. n. w.	s. e.	111	1¾	11.00 pm	.516	.554	.622	83	64	85	1 cir.	5 cu.	0	-----	-----	-----	--	4
Tuesday, 9-	w. s. w.	s. w.	s. s. w.	179	4	2.50 pm	.509	.612	.666	74	62	77	5cir.cu.s	6 cir.cu.	7 cu.	10 p m	10½ pm	0.30	.01	8
Wednesday, 10-	w. s. w.	n. n. w.	n. n. w.	246	5¼	1.15 pm	.666	.596	.644	77	48	85	0	3 cu.	0	-----	-----	-----	--	0
Thursday, 11-	n. n.w.	n. n. e.	s. s. e.	112	1½	9.10 am	.465	.449	.586	78	52	80	0	0	0	-----	-----	-----	--	1
Friday, 12-	w.	s. s. w.	s. s. w.	137	2	5.40 pm	.476	.624	.666	69	59	77	2 cir. s.	7 cir.	1 cu.	-----	-----	-----	--	6
Saturday, 13-	w. s w.	s. w.	n. n. e.	230	3¾	4.00 pm	.608	.768	.829	80	51	78	7 cu.	4 cu.	5 cu.	-----	-----	-----	--	

Distance traveled during the week	1,202 miles.	Total amount of water for the week	.75 inch.
Maximum force	6¾ lbs.	Duration of rain	13 hours, 30 minutes.

DANIEL DRAPER, Ph. D.

Director Meteorological Observatory of the Department of Public Parks, New York.